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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C. 1800 DIAGONAL ROAD SUITE 370 ALEXANDRIA, VA 22314			RUTZ, JARED IAN	
		ART UNIT	PAPER NUMBER	2187

DATE MAILED: 08/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/786,108	KANEDA ET AL.	
	Examiner	Art Unit	
	Jared I. Rutz	2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 26 February 2004.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-25 is/are pending in the application.
 - 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-25 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 26 February 2004 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ . |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>7272005</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

Claims 1-25 as originally filed on 2/26/2004 are pending in the instant application. Of these there are 6 independent claims and 19 dependent claims.

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: MANAGEMENT METHOD FOR HIERARCHICALLY CONFIGURED STORAGE.

3. The disclosure is objected to because of the following informalities: The arrangement of the claims is such that it is difficult to discern the individual elements of each claim. Where a claim sets forth a plurality of elements or steps, each element or step of the claim should be separated by a line indentation. There may be plural indentations to further segregate subcombinations or related steps. See 37 CFR 1.75 and MPEP § 608.01(i)-(p).

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. **Claims 8, and 19-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. An identifier, an identifier format, and identifier format information are recited in these claims. The identifier is described in page 9 lines 12-15 of the specification as referring to the volumes in the storage units. Page 7 lines 2-3 identify a volume as being a virtual storage area. Page 13 lines 25-26 states "Each storage unit has an identifier." From the standard use of the term "storage unit" in the art, it is believed that storage units are physical devices, for example hard disk drives or memory of some variety. The examiner is uncertain if the claimed identifiers identify the virtual volumes or the physical storage units.

6. The description on page 15 lines 2-3 states that the identifier has a field representing the volume number. Page 14 lines 1-2 state that the identifier management computer is needed because different storage units have different identifier formats. As the identifiers of the storage units as set by the manufacturer of the devices refer to physical devices and the volumes are virtual storage areas, the examiner fails to see the connection between virtual storage area identifiers and physical storage device identifiers, and why the physical storage device identifier would be included in the virtual storage space identifier. Virtual storage identifiers are typically

at a higher level of abstraction than the physical device identifiers, and are handled by different levels of a computer system. This belief is strengthened by page 7 lines 5-7, which state that a volume may span more than one storage unit.

7. As it cannot be determined what the identifiers are, one of ordinary skill in the art would be unable to make the claimed invention.

8. For the purpose of this action, the examiner assumes that the identifier, identifier format, and identifier format information refer to the virtual storage volumes.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. **Claim 9** is rejected under 35 U.S.C. 112, second paragraph for failing to clearly define the metes and bounds of the claim. The prolix recitation, which includes descriptions of the physical connection of components, steps to be performed by a management computer, and methods for performing various actions, makes it difficult to ascertain what precisely is being claimed.

11. **Claims 10-14** are rejected due to their dependence on claim 9.

12. **Claims 8, and 19-23** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The explanation given above with respect to these same claims explains the reasons that these claims fail to particularly point out the invention.

13. **Claim 23** is further rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 23 repeatedly recites the limitation "among other things" which is indefinite as it does not clearly set the boundaries of the claim.

Claim Rejections - 35 USC § 101

14. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

15. **Claim 9** is rejected under 35 U.S.C. 101. In view of the rejection under 112, 2nd paragraph, above, claim 9 raises a question as to whether it is intended to be directed to a computer and software stored and executable therein, or a process of executing software. As such, it is unclear to what statutory category of invention it is intended to belong.

16. **Claim 17** is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. As the claim is directed to a program, which is descriptive material, and not embodied as a computer readable medium, it is considered descriptive material and therefore unpatentable. Claim 17 will not be treated further on the merits, however, as claim 18 embodies the restrictions of claim in a tangible computer readable medium and thus places claim 18 as directed to statutory subject matter.

Claim Rejections - 35 USC § 102

17. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

18. **Claim 1-5, 9, 15, 18 and 24** are rejected under 35 U.S.C. 102(b) as being

anticipated by Clifton et al (US 4,310,883).

19. **Claim 1** is taught by Clifton as:

a. A computer system comprising a plurality of storage units each containing one or more volumes for storing data used by the computer. See column 1 line 63 to column 2 line 4, which shows that data is stored both on DASD and data cartridges. See also column 1 lines 46-55, which show that pairs of data on the cartridges are referred to as volumes.

b. And a management computer for managing the status of the plurality of storage units. See figure 1 item 18, which shows the mass storage controller.

c. One or more first-level storage units each containing one or more volumes for storing data used by the computer. See column 1 line 63 to column 2 line 4 which, shows the use of DASD to form a first level of storage.

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- d. One or more second-level storage units each of which is connected through a communication path to, and hierarchically linked to, one of the first-storage units and contains one or more volumes for storing data used by the computer. See column 1 line 62 to column 2 line 8, which shows that the mass storage facility is the second-level storage units. It goes on to explain that volumes stored in the second-level storage are transferred to the DASD storage in a process called staging, which creates a hierarchical relationship. As the data is moved between the second and first level storage, it is inherent that they are connected by a communication path.
- e. Volume information collecting means for collecting information on the volumes contained in the first-level and the second-level storage units. See column 2 lines 34-38, which show that the mass storage controller finds the requested data in the second-level storage and finds space in the first-level storage. The mass storage controller provides the volume information collecting means (See column 9 lines 45-52). See also column 1 lines 21-22, which states that storage management entails monitoring space usage.
- f. Hierarchical information collecting means for collecting information on the hierarchical relationships between volumes contained in the first-level storage and the second-level storage units. See column 1 lines 25-27, which states that the prime purpose of the mass storage system is the management of the storage hierarchy. The mass storage controller provides the hierarchical information

collecting means, as it controls the staging and destaging operations, which create the hierarchical relationships (column 8 lines 45-46).

g. Effective capacity calculating means for calculating the total effective capacity based on the volume information and the hierarchy information thus collected. See column 1 lines 41-45, which state that the space of the mass storage system volume space is monitored, and also column 1 lines 21-22, which states that storage management entails monitoring space usage. See again column 1 lines 63-64, which state that the mass storage system is the hierarchical system including the DASD and the tape library, and also column 1 lines 21-22. In order to monitor the capacity of the system, it is inherent that the mass storage controller is able to calculate the effective capacity.

20. **Claim 2** is taught by Clifton as:

h. Wherein the first-level and the second-level storage units each contains one or more virtual storage areas as volumes. See column 2 lines 54-65, which show that the storage levels contain virtual volumes.

i. And the management computer comprises the volume information collecting means, the hierarchy information collecting means, and the effective capacity calculating means. See column 5 lines 47-50, which state that the procedures of the invention are initiated and monitored by programs on the system which controls the selection of a mass storage virtual volume. As shown above, these means are provided by the mass storage controller

21. **Claim 3** is taught by Clifton as:

j. Wherein each of the first-level storage units comprises means for storing the information on the hierarchical relationships between volumes contained in it and volumes contained in the second-level storage units. See column 8 lines 28-34, which states that the storage director, a control unit of the mass storage controller (see column 8 lines 24-26), maintains tables showing the location of all the virtual volumes. See further column 11 lines 56-64, which show that these tables are referred to as mass storage volume inventory (MSVI). The MSVI is stored in the DASD units (illustrated as item 28 of figure 3).

22. **Claim 4** is taught by Clifton as:

k. Wherein the information collected by the volume information collecting means includes at least the identifier and the information on the capacity of each volume contained in the first-level and the second-level storage units. Figure 5 shows the data stored in the MSVI. Column 12 lines 38-40 show that the record identification is stored. Column 12 lines 65-67 show that the storage of information about the space in the volume is stored.

23. **Claim 5** is taught by Clifton as:

l. Wherein the information collected by the hierarchy information collecting means includes the information indicating the relationship between the identifier of each volume contained in the first-level storage units and the identifier of its corresponding volume contained in the second-level storage unit. Column 12 lines 58-60 show that the number of the cartridges in the library that are associated with the volume.

24. **Claim 9** is taught by Clifton as:

- m. A management computer for managing the status of storage units containing volumes for storing data used by a computer. This is taught by the mass storage controller as shown with respect to claim 1.
- n. Executes volume information collecting program for collecting information on the volumes from one or more first-level storage units containing volumes for storing data used by the computer and from one or more second-level storage units each of which is connected through a communication path to, and hierarchically linked to, one of the first-level storage units and contains at least one volume for storing data used by the computer. This structure had been shown with respect to claim 1, and claim 2 shows that it is performed by a program executing on the mass storage controller.
- o. Hierarchy information collecting program for collecting information on the hierarchical relationships between volumes in the first-level storage units and volumes in the second-level storage units. This structure had been shown with respect to claim 1, and claim 2 shows that it is performed by a program executing on the mass storage controller.
- p. Effective capacity calculating program for calculating the total effective capacity based on the volume information and the hierarchy information thus collected. This structure had been shown with respect to claim 1, and claim 2 shows that it is performed by a program executing on the mass storage controller.

25. **Claim 15 is taught by Clifton as:**

q. A management method for managing, using a management computer, capacities of volumes storing data used by a computer, comprising the steps of: providing a volume in a first storage unit for storing data used by the computer.

See column 1 line 63 to column 2 line 4 which, shows the use of DASD to form a first level of storage.

r. Establishing a hierarchical relationship between the first storage unit and a second storage unit that allows a volume to be shared between the two. See column 1 line 62 to column 2 line 8, which shows that the mass storage facility is the second-level storage units. It goes on to explain that volumes stored in the second-level storage are transferred to the DASD storage in a process called staging, which creates a hierarchical relationship.

s. Collecting from the first storage unit information on the volumes contained in it, and collecting from the second storage unit information on the volumes contained in it. Collecting information on the hierarchical relationships between the volumes contained in the first storage unit and the volumes contained in the second storage unit. See column 24 lines 17-23, which show that the information on the volumes is requested when the host CPU requests a storage area. The mass storage controller examines the information describing the volume, which is not the data stored in the MSVI register.

t. Calculating the total effective capacity to the computer based on the information on the volumes and the information on the hierarchical relationships.

See column 25 lines 35-40, which show that the capacity of the volume is checked.

26. **Claim 18** is taught by Clifton as:

u. A program designed to run on a management computer for managing the storage capacities of storage units containing volumes for storing data used by a computer. See column 5 lines 47-50, which state that the procedures of the invention are initiated and monitored by programs on the system which controls the selection of a mass storage virtual volume. The mass storage controller provides the means for collecting data from the first and second storage units, means for collecting information on the hierarchical relationships, and means for calculating the total effective capacity as shown with respect to claim 9 above.

27. **Claim 24** is taught by Clifton as:

v. A management computer for managing the status of storage units containing volumes for storing data used by a computer, comprising CPU and a network interface unit connected by a management network, (the primary host CPU, figure 1 item 20, and its I/O controller, item 24).

w. Wherein CPU collects information on the volumes from one or more first level storage units containing volumes for storing data used by the computer and from one or more second level storage units each of which is connected through a communication path to, and hierarchically linked to one of the first level storage units and contains at least one volume for storing data used by the computer, and information on the hierarchical relationships between volumes in the first

level storage units and volumes in the second level storage units via said network interface. These actions have been shown to be performed by the mass storage controller, which in column 7 lines 32-36 is shown to be under the control of the primary host CPU.

x. And calculates the total effective capacity based on the volume information and the hierarchy information thus collected. As shown above, this is performed by the mass storage controller, which is under the control of the primary host CPU.

Claim Rejections - 35 USC § 103

28. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

29. **Claims 6-7, 10-14, 16, 22, and 25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton (cited supra) in view of Prahlad et al (US 2004/0250033).

30. With respect to claims 6-7, 10-14, and 25, Clifton discloses a storage management method and apparatus for a hierarchically arranged storage system. Clifton does not expressly disclose the use of a display or graphical user interface to interact with the storage management system.

31. Prahlad discloses the use of a graphical user interface for viewing and managing a storage device having data volumes with a hierarchical relationship.

32. Clifton and Prahlad are analogous art as they are from the same field of endeavor, namely the design and management of storage systems having hierarchical relationships. At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Clifton and Prahlad before them, to use a display system similar to that of Prahlad to visualize and interact with the storage management system. The motivation for doing so would be to create an easy to use method for controlling the grouping of volumes (Clifton column 11 lines 27-30). It is well known in the art of computing to use a graphical user interface to view and control aspects of storage devices. Therefore it would have been obvious to combine a graphical user interface such as the one taught by Prahlad to monitor and control the storage system of Clifton to obtain the invention as specified in claims 6-7, 10-14, and 25.

33. **Claim 6, 10, 16** are taught by Prahlad as:

y. Wherein the management computer comprises a display for displaying the information collected by the volume information collecting means and the result of the calculation made by the effective capacity calculating means. See paragraph 0076 which discusses the user interface screen, and lines 23-25 of the same paragraph, which shows that information such as association and capacity may be displayed.

34. **Claim 7, 12** is taught by Prahlad as:

z. Wherein the management computer comprises a display that has a first display section for displaying the volume information of the volumes contained in

the second level storage units that are used by the first level storage units and a second display section for displaying the volume information of other volumes.

See figure 6 item 610 which shows the snapshots being shown in a separate folder from the other information in the system.

35. **Claim 11 is taught by Prahlad as:**

aa. Further comprising a display for displaying information on the volumes in the first-level storages that are made available to the computer and an input device for inputting information on volumes. Paragraph 0076 shows a display of storage information in which specific objects may be selected.

bb. Wherein information on volumes is displayed on the display as objects, and when a specific object on the display is selected by the input device, the corresponding volume in the second level storage unit located through the hierarchy information will be identified, and the corresponding volume information obtained by the volume information collecting means from the corresponding volume will be displayed on the display. See paragraph 0076 lines 18-25.

36. **Claim 13 is taught by Prahlad as:**

cc. Further comprising a display for displaying as objects volume information of the volumes in the first-level storage units collected by the volume information collecting means. See paragraph 0076.

dd. Wherein a first object indicating that the volume in a first level storage unit is actually provided by a volume in a second level storage unit and a second object representing the volume in the second level storage unit that is actually

provided as the volume in the first level storage unit are displayed on the display in such a way as to reflect the hierarchical relationship between them.

Paragraph 0076 line 22-24 states that the association of a snapshot may be displayed.

37. **Claim 14 is taught by Prahlad as:**

ee. Wherein on the display either a screen where information on volumes in the second level storage units that are used by the first level storage units is hidden or a screen showing information on volumes in the second level storage units that are not used by the first level storage units is selectively displayed.

Figure 7 shows the display being a window with features that allow the window to be selectively hidden or closed. Such behavior is well known in the art of using Microsoft Windows, or any of a number of graphical windowing environments.

38. **Claim 22 is taught by Prahlad as**

ff. Wherein the screen of the display has a display section for displaying the identifier, capacity and associated icon of each upper level volume, a display section for displaying the identifier, capacity, and associated icon of each lower level volume, and a display section for displaying the total available capacity.

See Prahlad paragraph 0076 lines 18-25, which says that relevant details are shown. It is known to one of average skill in the art that identifiers (such as "c:" in a Windows system) and capacity are commonly shown in a browser window.

39. **Claim 25 is taught by Prahlad as:**

gg. Further comprising a display for displaying the information collected and the result of the calculation by said CPU. See paragraph 0076.

40. **Claims 8, 19, and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton (cited *supra*) in view of Kusters et al (US 6,681,310).

41. With respect to claims 8, 19, and 20, Clifton discloses a method and apparatus for managing a hierarchical storage system as discussed above with respect to claims 1-5, 9, 15, 18 and 24. Clifton does not explicitly disclose a method or device for allowing the use of storage devices from different manufacturers.

42. Kusters discloses a storage management system with a volume manager that allows multiple storage devices from different manufacturers without the higher level system needing to know the specifics of each device.

43. Clifton and Kusters are analogous art because they are from the same field of endeavor, the design of data storage systems.

44. At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the system disclosed by Kusters to allow hardware having different lower level structures in the hierarchical storage system of Clifton.

45. The motivation for doing so would have been to allow the use of different types and manufacturers of storage units with the same application programming interface (Kusters column 2 lines 34-39), which makes the lower level details of the system more transparent to users allowing the entire storage system to appear to users as a plurality of disk drives all directly available to the host computer (Clifton column 2 lines 54-56).

46. **Claim 8 is taught by Kusters as:**

hh. Further comprising an identifier management computer for managing the formats of the identifiers of the volumes used in it, wherein each of the first level and the second level storage units comprises means for inquiring the format of the identifier management computer (Kusters column 6 lines 57-63). The storage devices of Kusters have volume providers which map logical storage volumes onto the physical storage devices. In order to do this it is inherent that they are able to get the format of the logical volumes.

ii. And means for composing the volume information and the hierarchy information in accordance with the identifier format held in the identifier management computer. The volume providers perform management tasks such as configuration and monitoring of the storage, and as such it would be obvious to use them to gather the information relating to the logical volume units stored on their physical storage device (Kusters column 7 lines 41-48).

47. **Claim 19 is taught by Kusters as:**

jj. Further comprising an identifier management computer connected through the communication path to the first level storage units, the second level storage units, and the management computer. As the Common Volume Manager of Kusters allows the computer system to communicate with the storage devices, it is inherent that it is connected through the communication path.

kk. Wherein the identifier management computer stores in a memory located in it, and manages, identifiers for identifying the first level and the second level

storage units in a standardized format. Kusters column 8 lines 37-41 show that the common volume manager provides a globally unique identifier for each logical volume, storage device, and volume provider.

II. And upon receiving a request for identifier format information from one of the first level or the second level storage units or the management computer retrieves the requested identifier format information from the memory and sends the requested identifier format information to the first level or the second level storage device or the management computer requesting it. Kusters column 8 lines 37-41 show that the common volume manager provides the globally unique identifier. This information is necessary for the management of logical units performed by the volume providers, and must be sent to them for them to perform their tasks.

48. **Claim 20 is taught by Kusters as:**

mm. A step of registering in a memory, and managing, identifier format information for identifying the first level storage units and the second level storage units in a standardized format. Kusters column 8 lines 37-41 show that the common volume manager provides a globally unique identifier for each logical volume, storage device, and volume provider. It is inherent that this information must be stored in a memory.

nn. Wherein the management computer, when started up, retrieves the identifier format information from the memory, and, when collecting from the first level and the second level storage units information on the volumes contained in

them and when collecting information on the hierarchical relationships between them, obtains the information thus collected based on the identifier format information. Kusters teaches a system that provides a uniform API for varying types of storage devices having differing characteristics. When a system is started, it loads from memory information on how to communicate with the devices available to it. As the storage system is attached to the management computer, it is inherent that it would load the information on how to communicate with the storage system. As the API provides a uniform method for communicating with the storage system, it is obvious that the data relating to the logical volumes would be based on that API.

49. **Claim 23** is rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton (cited supra) in view of Kusters (cited supra) as applied to claims 6-7, 10-14, and 25 above, and further in view of Prahlad (cited supra).

50. With respect to claim 23, Clifton teaches:

oo. In a computer system including one or more first level storage units each containing one or more volumes for storing data used by a computer. See Clifton column 1 line 63 to column 2 line 4, which shows that data is stored both on DASD and data cartridges. See also Clifton column 1 lines 46-55, which show that pairs of data on the cartridges are referred to as volumes.

pp. One or more second level storage units each of which is connected through a communication path to, and hierarchically linked to one of the first level

storage units and contains one or more volumes for storing data used by the computer. See Clifton column 1 line 63 to column 2 line 4.

qq. And a management computer for managing the status of the volumes contained in the first level and the second level storage units. See figure 1 item 18, which shows the mass storage controller.

rr. A management method for managing the volumes contained in the first level and the second level storage units comprising providing volumes in the first level storage units for storing data used by the computer. See Clifton column 1 line 63 to column 2 line 4.

ss. Establishing a hierarchical relationship between one of the first level storage units and one of the second level storage units that allows a volume to be shared between the two. See Clifton column 1 line 63 to column 2 line 4.

tt. Issuing a request for volume information from the management computer to the first level and second level storage units. The mass storage controller provides the volume information collecting means (See Clifton column 9 lines 45-52). See also Clifton column 1 lines 21-22, which states that storage management entails monitoring space usage.

uu. Composing, based on the volume information and the inter-volume hierarchy information thus collected, a consolidated information table including an upper volume column containing the identifier, capacity, icon number, a flag indicating the existence of subordinate volumes for each volume belonging to the higher level of hierarchy, and a lower volume column containing the identifier,

capacity, and icon number for each volume belonging to the lower level of hierarchy in the management computer. Clifton teaches the use of a MSVI. Clifton column 12 lines 38-40 show that the record identification is stored. Clifton column 12 lines 65-67 show that the storage of information about the space in the volume is stored. It would be obvious to store the other information in this table.

vv. Registering the consolidated information table in a memory. As the MSVI is stored, it is inherent that it is registered in a memory.

51. Clifton does not explicitly disclose the use of a identifier format information system to allow the use of storage devices from different manufacturers.
52. Kusters discloses a storage management system with a volume manager that allows multiple storage devices from different manufacturers without the higher level system needing to know the specifics of each device.

53. With respect to claim 23, Kusters teaches:

ww. Storing in a memory located in each of the first level and second level storage units identifier format information in a standardized format for identifying the first level and the second level storage units respectively. See Kusters column 6 lines 57-63. In order for the volume provider to know how to make a volume, it is necessary for it to have the identifier format information.

xx. Consulting the identifier format information stored in the memory in each of the first level and second level storage units upon receiving the request for volume information and sending to the management computer the volume

information including the number of volumes contained in it, their identifiers and their capacities in the format specified in the identifier format information. In order to return the requested information, it is inherent that the information would be returned in a way that is consistent with the API of the system.

54. Clifton and Kusters are analogous art because they are from the same field of endeavor, the design of data storage systems.

55. At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the system disclosed by Kusters to allow hardware having different lower level structures in the hierarchical storage system of Clifton.

56. The motivation for doing so would have been to allow the use of different types and manufacturers of storage units with the same application programming interface (Kusters column 2 lines 34-39), which makes the lower level details of the system more transparent to users allowing the entire storage system to appear to users as a plurality of disk drives all directly available to the host computer (Clifton column 2 lines 54-56).

57. Although Clifton and Kusters teach a hierarchical storage system and management method that provides a layer of abstraction between the lower level details of the storage devices and the interface the higher level system uses to communicate with the storage system, they do not address the use of a display for monitoring and managing such a system.

58. Prahlad teaches the use of a graphical display to browse and manage a hierarchically related storage system.

59. With respect to claim 23, Prahlad teaches:

yy. Displaying the contents of the consolidated information table retrieved from the memory in at least three display sections of the display: a display section for displaying the identifiers, capacities, and associated icons, among other things, of the volumes belonging to the higher level of hierarchy, a display section for displaying the identifiers, capacities, and associated icons, among other things, of the volumes belonging to the lower level of hierarchy, and a display section for displaying the total available capacity among other things.

The display of these elements is taught by Prahlad in paragraph 0076.

Separating the elements of the storage system into separate sections for display would be obvious to one of ordinary skill in the art.

60. Clifton, Kusters and Prahlad are analogous art as they are from the same field of endeavor, namely the design and management of storage systems having hierarchical relationships.

61. At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Clifton, Kusters and Prahlad before them, to use a display system similar to that of Prahlad to visualize and interact with the storage management system.

62. The motivation for doing so would be to create an easy to use method for controlling the grouping of volumes (Clifton column 11 lines 27-30). It is well known in the art of computing to use a graphical user interface to view and control aspects of storage devices.

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63. Therefore it would have been obvious to combine a graphical user interface such as the one taught by Prahlad to monitor and control the storage system of Clifton to obtain the invention as specified in claims 23.

Double Patenting

64. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

65. **Claim 1** is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of copending Application No. 10/811,868. Although the conflicting claims are not identical, they are not patentably distinct from each other because the difference between the two is the recitation in Application No. 10/811,868 that the data storage apparatuses are connected through a first network to computers. The connection of a storage system to a plurality of computers over a network is well known to one of ordinary skill in the art, and is also shown in figure 1 of the instant application.

Instant Application 10/768,108	Application 10/811,868
1. A computer system comprising a plurality of storage units each containing one or more volumes for storing data used by the computer And a management computer for managing the status of the plurality of storage units comprising	1. A management computer connected through a second network to data storage apparatuses that are connected to computers through a first network, said management computer comprising
One or more first level storage units each containing one or more volumes for storing data used by the computer	"wherein each piece of hierarchy information indicates hierarchy among data storage apparatuses held by a data storage apparatus concerned"
One or more second level storage units each of which is connected through a communication path to, and hierarchically linked to one of the first level storage units and contains one or more volumes for storing data used by the computer.	<i>This limitation shows that data storage apparatuses are connected hierarchically. This hierarchical connection creates first and second level storage units.</i>
Volume information collecting means for collecting information on the volumes contained in the first level and second level storage units	A storage area information collecting module which collects respective pieces of storage area information from said data storage apparatuses connected through the second network, wherein each piece of storage area information relates to storage areas provided by a data storage apparatus concerned
Hierarchical information collecting means for collecting information on the hierarchical relationships between volumes contained in the first level storage units and	A hierarchy information collecting module which collects respective pieces of hierarchy information from said data storage apparatuses connected through said second network, wherein each piece of hierarchy information indicates hierarchy among data storage apparatuses held by a data storage apparatus concerned and

Effective capacity calculating means for calculating means for calculating the total effective capacity based on the volume information and the hierarchy information thus collected.	A management relation information creation module which sets hierarchy among said data storage apparatuses to create management relation information, based on said pieces of storage area information collected in said storage area information collecting module
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66. **Claim 9** is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 8 of copending Application No. 10/811,868. Although the conflicting claims are not identical, they are not patentably distinct from each other. The first difference between the two is the recitation in Application No. 10/811,868 that the data storage apparatuses are connected through a first network to computers. The connection of a storage system to a plurality of computers over a network is well known to one of ordinary skill in the art, and is also shown in figure 1 of the instant application. The second difference is that it is specified that an arithmetic unit of the management computer performs the actions specified in the claim in Application No. 10/811,868, while the actions in the instant application are performed by code executed by the management computer. It is well known to one of ordinary skill in the art that code is executed by a CPU, which is an arithmetic unit and a integral part of a computer.

Instant Application 10/768,108	Application 10/811,868
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<p>9. A management computer for managing the status of storage units containing volumes for storing data used by a computer, executes</p>	<p>A management computer connected through a second network to data storage apparatuses that are connected to computers through a first network, wherein; said management computer comprises an arithmetic unit and a memory; and said arithmetic unit;</p>
<p>Executes volume information collecting program for collecting information on the volumes from one or more first-level storage units containing volumes for storing data used by the computer and from one or more second-level storage units each of which is connected through a communication path to, and hierarchically linked to, one of the first-level storage units and contains at least one volume for storing data used by the computer</p>	<p>collects respective pieces of storage area information from said data storage apparatuses connected through said second network, wherein each piece of storage area information relates to storage areas provided by a data storage apparatus concerned;</p>
<p>Hierarchy information collecting program for collecting information on the hierarchical relationships between volumes in the first-level storage units and volumes in the second-level storage units</p>	<p>collects respective pieces of hierarchy information from said data storage apparatuses connected through said second network, wherein each piece of hierarchy information indicates hierarchy among data storage apparatuses held by a data storage apparatus concerned;</p>
<p><i>It is inherent that if the hierarchy information is collected that it has been set.</i></p>	<p>sets hierarchy among said data storage apparatuses to create management relation information, based on said pieces of storage area information and said pieces of hierarchy information</p>
<p>Effective capacity calculating program for calculating the total effective capacity based on the volume information and the hierarchy information thus collected.</p>	<p>and of storing the created management relation information into said memory; and outputs said management relation information stored in said memory.</p>

It is inherent that if a value is calculated by a CPU, it will be stored in a memory and returned to the entity that caused its calculation.

Conclusion

67. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. In addition to the graphical user interface as shown above, Prahlad also teaches a management system for data volumes having a hierarchical relationship and calculating the size of the stored data. A similar system also appears in Ofek et al (US2004/0098547).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jared I. Rutz whose telephone number is (571) 272-5535. The examiner can normally be reached on M-F 8:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on (571) 272-4201. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jared I Rutz
Examiner
Art Unit 2187

jir JIR



CHRISTIAN CHACE
PRIMARY EXAMINER